**3.6**

**Mathematics of Finance**

**Interest Compounded Annually:**

If a principal P is invested at a fixed annual interest rate r, calculated at the end of each year, then the value of the investment after n years is:

 (r is a decimal)

Ex. Suppose Jessie finds a $51 bill on the ground at Utah State. She decides to put it in the bank until she graduates. Many obstacles prevent her from graduating for several years. Twenty-five years later at her graduation she finds a $3 bill and remembers the $51 she put in the bank. How much money does Jessie now have if the rate was 11.5%?

+$3 that she found = $778.25!

**Compounding k-times per year**

 k is the number of times per year interest is compounded

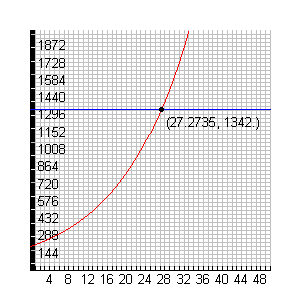
EX. Jessie has become a little wiser now that she has finally graduated from college. She decides to put her $778.25 in another account with an interest rate of 13.2% that compounds monthly. How much money will she have after she receives her master’s degree 10 years later?



**Finding the time period of an investment**

EX. Jackie has $200 to invest at 7% annual interest compounded monthly. How long will it take for her investment to grow to $1,342?



We can solve graphically: Graph  and 

The intersection is at the point (27.27, 1342), therefore it

will take 27 years 3 months to have $1342 in the bank.

We can solve algebraically,

    =



**Interest Compounded Continuously**

 r- interest rate t- time

Ex. Jessie and Jackie’s brother Cole is a bit wiser with money. He has earned $1500 over the summer mowing lawns. He finds a bank that compounds interest continuously at a rate of 11.5%. He decides to put his money in the bank until he graduates from high school so, he will have some money for college. After 3 years he graduates and is ready to start college. How much money does he have in the bank?



Cole receives a track scholarship (at the U of U) and decides to keep the money in the bank until he graduates from college. After four years he graduates, how much money does he have in the bank now?



**Future Value of an Annuity**

The future value FV of an annuity consisting of n equal periodic payments of R dollars at an interest rate *i* per compounding period (payment intervals) is:



Ex. At the end of each quarter year Clay makes a payment of $100 into his college fund. It earns 8.11% annual interest compounded quarterly. What will be the value of his investment in 5 years when he is ready to start college?



**Present Value of an Annuity**

The present value of an annuity consisting of n equal payments of R dollars earning an interest rate *i* per period is:



EX. After their kids finally graduate from college the Lambournes can finally buy a new vehicle. They purchase an SUV for $33,333. What are the monthly payments for a 5 year loan with a $3,000 down payment and an APR of 3.3%?



R = $549.10

